

# NGST Systems Engineering Report

## Thermal Subsystem 03

Title: <b>Baseline Yardstick Thermal Results after Model Updates and Conversion to TSS</b>	
Date: 2/1/98	Number: THSER03
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References 1. K. Parrish/GSFC, Updated Thermal Modeling Process using FEMAP, TSS, TCON, and SINDA85, THSER02, 5-4-98 2. K. Parrish/GSFC, "Integrated Modeling Peer Review –Thermal," presentation, 1-27-98	

### Description

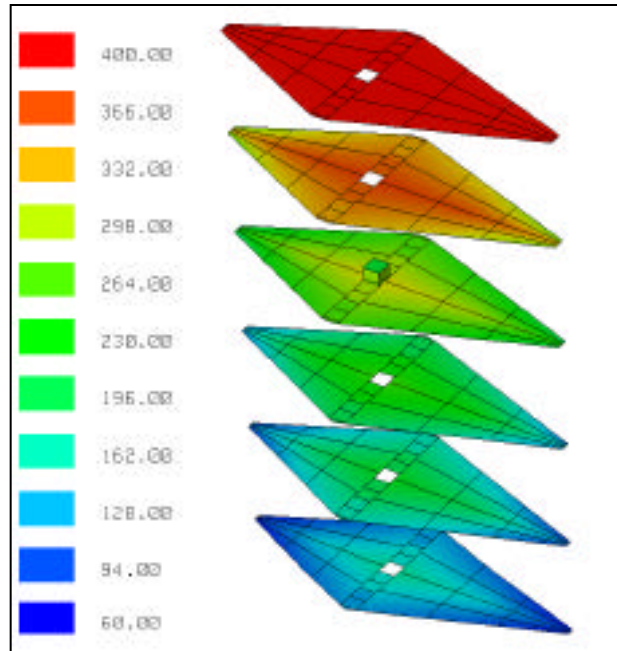
This SER documents the system level model steady state thermal results after the thermal geometry model was updated and converted to TSS. The model was updated using the thermal results from the Fall 1997 quarterly. Baseline end of life (EOL) temperatures are presented for the sunshield and OTA. These temperature results serve as baseline values for all other case and parametric results comparisons.

### Results Summary

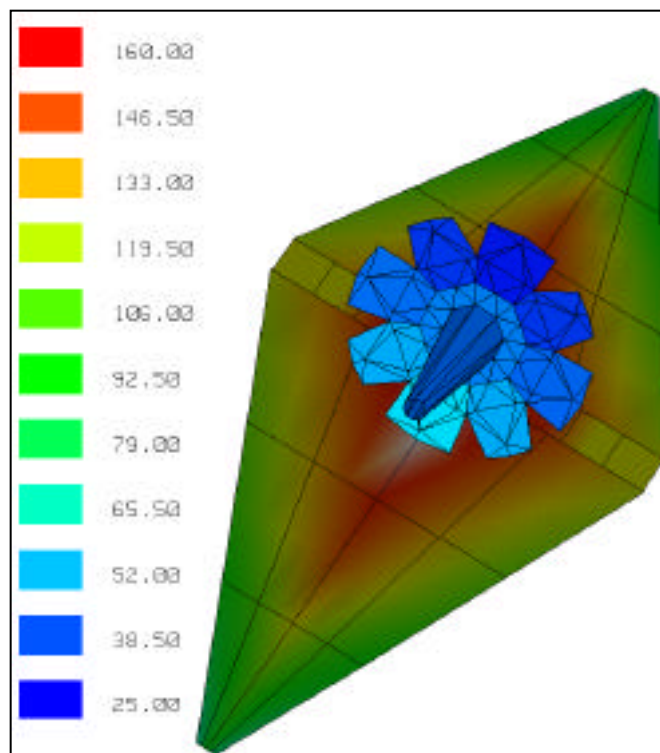
Temperature results are presented in Table 1. Figure 1 graphically illustrates the temperatures across drop across the six layer sunshield. Figure 2 illustrates the temperatures across shade layer six along with the primary mirror temperature. The results presented are for the EOL, with the sun perpendicular to the sunshield. A detailed heat map is illustrated in Figure 3.

**Table 1 Baseline Steady State Results, Temperature in K**

Assembly	EOL		
	Avg	Min	Max
SSM	293	293	293
Shade Layer 1 , sunward	395	395	395
Layer 2	336	300	359
Layer 3	263	214	295
Layer 4	190	141	230
Layer 5	157	113	193
Layer 6	121	86	151
Primary Mirror	46	36	55
Secondary Mirror	22	22	22



**Figure 2** Temperature Drop Across Sunshield



**Figure 2** Layer Six and OTA Temperatures

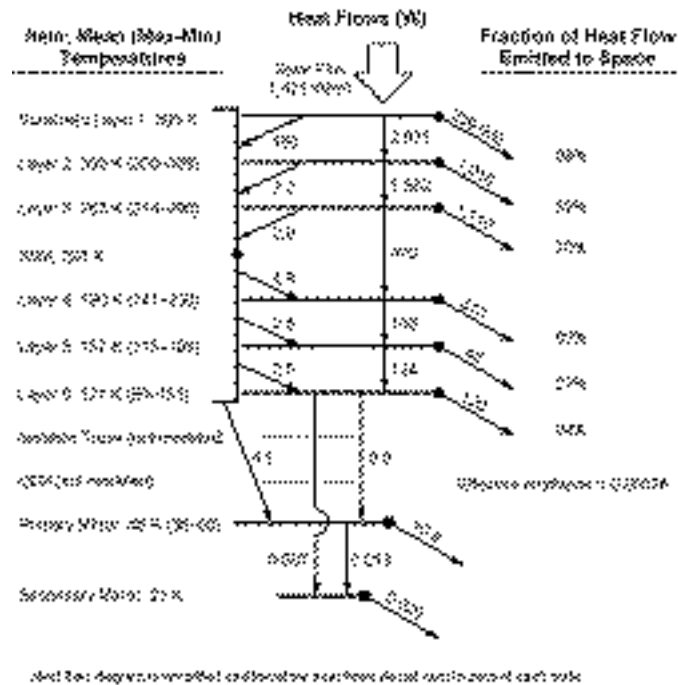


Figure 3 Heat map for the EOL, normal Sun angle

### Detailed Discussion

After the Fall 1997 NGST Quarterly, all of the system level models were updated to the new baseline thermal configuration. The primary changes were the addition of two more layers to yield a six layer shield, and the use of a low emittance surface on the layer facing the OTA. The

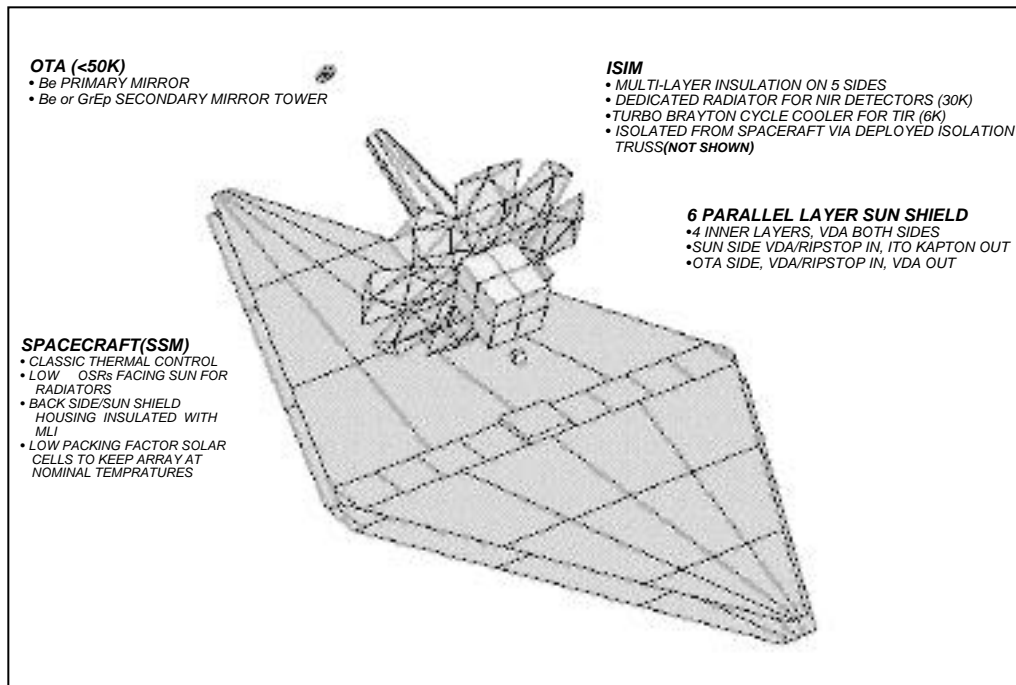
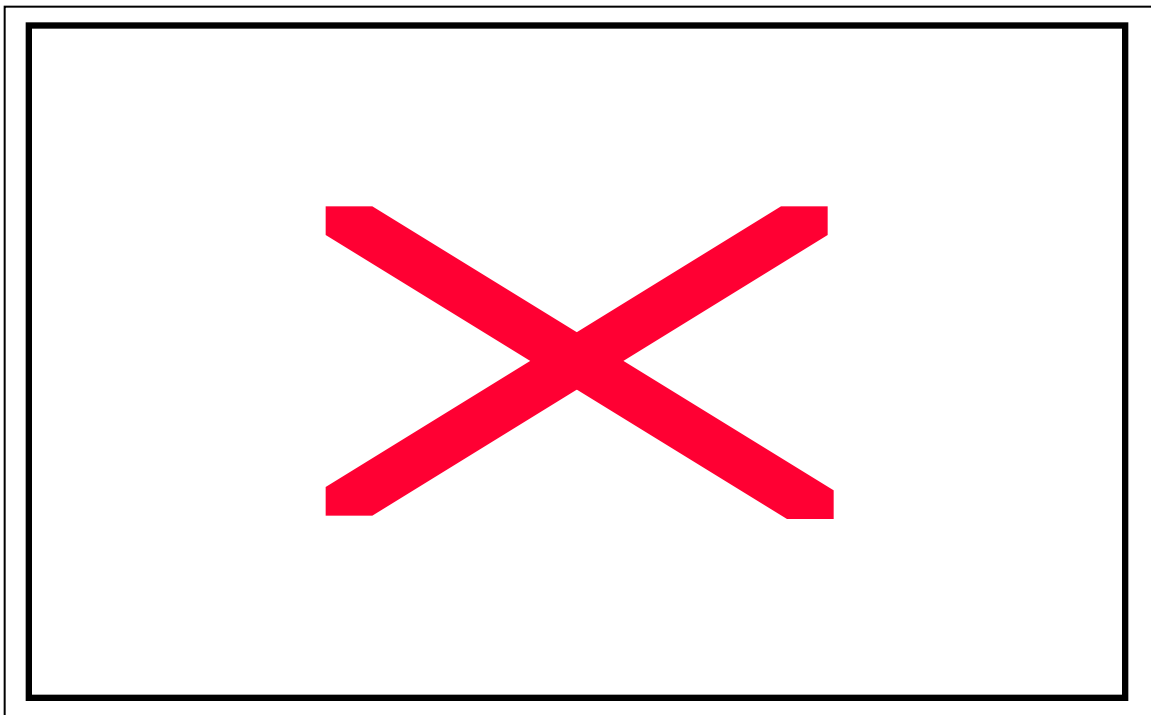


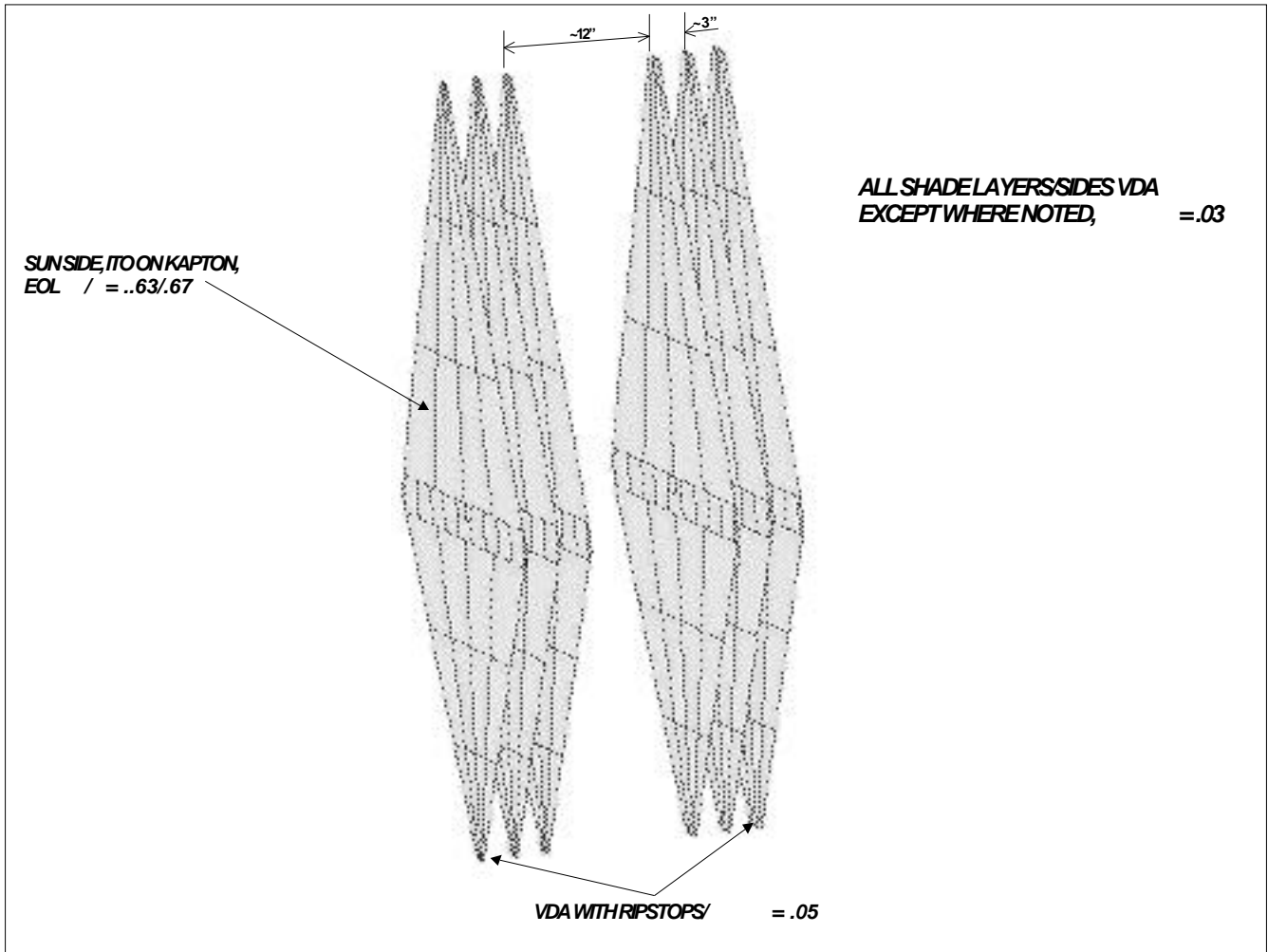
Figure 4 NGST Yardstick Baseline Thermal Configuration

OTA portion of the model was based on the MSFC detailed thermal model which was directly based on the April 1997 structural finite element model. The detailed OTA thermal model was reduced using FEMAP and subsequently converted to TSS using TCON. TSS was then used instead of the previously used TRASYS to solve for all imposed heating rates and radiation interchange factors. Figures 4, 5, and 6 illustrate the updated baseline design and thermal models.

The results indicate an average primary mirror temperature of less than 50 K at the end of life. The models still do not include an instrument model or isolation truss although conduction to the OTA via the isolation truss is included. The spacecraft bus or SSM is held at a boundary temperature of 20 °C. The updated model will serve as a baseline for detailed instrument design studies and parametric analyses of other parameters effecting shade performance. These EOL results have been provided to MSFC for inclusion in the detailed OTA thermal analyses.



**Figure 5** Baseline Thermal Configuration cont.



**Figure 6** Baseline Thermal Configuration cont.